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The GRACE Mission: Meeting the Technical Challenges
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The Gravity Recovery and Climate Experiment (GRACE) Mission is scheduled for launch in June 2001. Within the first year of the GRACE Mission, the project has a minimum science requirement to deliver a new model of the Earth's static geoid with an error of less than 1 cm to spherical harmonic degree seventy (70). However, the performance of the GRACE Mission is designed to exceed this minimum requirement by a factor of 25 or more. For spherical harmonic degrees of up to 40, we expect to improve the current knowledge of the gravity field by one thousand (1000x).

The GRACE Mission uses the satellite-to-satellite tracking (SST) technique. The twin GRACE satellites are the instruments that measure the nonuniformities in the Earth's gravity field. Nonuniformities in the gravity field cause the relative distance between the centers-of-mass of the two satellites to vary as they fly over the Earth. Atmospheric drag is the largest non-gravitational disturbing force. Drag is measured and will be used to correct changes in the satellite-to-satellite range measured by an SST microwave link. The microwave link will measure changes in the range between the two GRACE satellites with an error approaching 1 μm . We will discuss how these instrumentation requirements affect the configuration, the mass balance, the thermal control and the aerodynamic design of the satellites, and the design of the microwave SST link and the accelerometer. Finally, the question of how noise in these components limits the overall accuracy of the gravity models will be addressed.